FIVE-YEAR REVIEW REPORT
PJP LANDFILL SUPERFUND SITE
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

Prepared by

U.S. Environmental Protection Agency
Region II
New York City, New York

Approved:

Walter E. Mugdan, Director
Emergency and Remedial Response Division

Sept. 30, 2013
Date

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EXECUTIVE SUMMARY

This is the first five-year review for the PJP Landfill Superfund Site located in Jersey City, New Jersey. This site has one operable unit (OU1).

The Record of Decision (ROD) called for removal of contaminated material, construction of a cap with a gas venting system, monitoring of groundwater at the Site and surface water in the Hackensack River, assessment of the wetlands and replacement of the Sip Avenue Ditch to provide drainage in the area. NJDEP is the lead agency for this Site.

Since the issuance of the ROD on September 28, 1995, portions of the property have been bought by two separate entities. The western portion of the site was purchased in March 2008 by AMB Property, L.P. and AMB Pulaski Distribution Center, LLC together known as AMB. AMB is now owned by Prologis, which is constructing a warehouse and transfer station on their portion of the Site. The remedy on the northern portion of the Site was completed by Waste Management of New Jersey, Inc. and CWM Chemical Services, LLC (together known as CCS) in May 2012, and was subsequently purchased by Jersey City. Jersey City plans to develop their portion of the Site into a public park.

The remedy at the PJP Landfill is expected to be protective of human health and the environment upon completion. In the interim, response activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: PJP Landfill		
EPA ID: NJD 980 505 648		
Region: 2	**State:** NJ	**City/County:** Jersey City/Hudson County

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: NJDEP
Author name (Federal or State Project Manager): Renee Gelblat
Author affiliation: EPA
Review period: 7/24/2008 - 6/30/2013
Date of site inspection: May 16, 2013
Type of review: Statutory
Review number: 1
Triggering action date: 7/24/2008
Due date *(five years after triggering action date)*: 7/24/2013

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1 – removal of contaminated material, construction of a cap with a venting system, monitoring of groundwater at the Site, monitoring of surface water in the Hackensack River, assessment of the wetlands and replacement of the Sip Avenue Ditch to provide drainage in the area.

Five-Year Review Summary Form (continued)

Issues and Recommendations Identified in the Five-Year Review:				
OU(s):	**Issue Category: No Issue**			
	Issue: N/A			
	Recommendation: N/A			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
N/A	N/A	N/A	N/A	N/A

Protectiveness Statement(s)
Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU1 – Entire Site	Will be Protective	N/A

Protectiveness Statement:
The remedy is expected to be protective of human health and the environment upon completion. In the interim, response activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

I. Introduction

This first five-year review for the PJP Landfill site (Site), located in Jersey City, Hudson County, New Jersey, was conducted by Renee Gelblat, the U.S. Environmental Protection Agency (EPA) remedial project manager (RPM) for the Site. It was conducted pursuant to Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. §9601 et seq. and 40 CFR §300.430(f)(4)(ii), and in accordance with the Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P (June 2001). A five-year review is required by statute at this Site because hazardous substances, pollutants or contaminants remain at the Site above levels that do not allow for unlimited use and unrestricted exposure. The purpose of a five-year review is to ensure that the remedial actions remain protective of public health and the environment and are functioning as intended by the decision documents. This document will become part of the site file.

The PJP Landfill Site is being addressed as one operable unit which addresses contamination of the surface and subsurface soils, groundwater, and surface water. The trigger date for this statutory five-year review is the initiation of remedial activities.

II. Site Chronology

Table 1 (attached) summarizes site-related events from discovery to present activities.

III. Background

Physical Characteristics

The PJP Landfill Superfund Site is an inactive landfill located at 400 Sip Avenue, Jersey City, Hudson County, New Jersey. The Site occupies approximately 87 acres and is bordered on the north and west by the Hackensack River and on the southeast by Truck Routes 1 and 9. There are various light industries along the other borders and multiple-dwelling housing units located northeast and southeast of the Site. The Site is bisected by the Sip Avenue Ditch which runs roughly east-west and conveys run-off from the PJP landfill and the Jersey City stormwater/sewer system into the Hackensack River. The Pulaski Skyway, an elevated highway, passes over a portion of the Site. (Figure 1)

Land and Resource Use

The Site was originally a salt marsh, part of which was condemned in 1932 for construction of an elevated portion of the Pulaski Skyway. In the early 1970s, the PJP Landfill Company operated a commercial landfill which accepted chemical and industrial wastes.

Since closure of the landfill, operations on the Site were industrial and commercial. Most were

located on the northern portion of the Site (north of the Sip Avenue Ditch). A material staging area (referred to during the remedial investigation (RI) as the RV Salvage Yard) is located adjacent to the Hackensack River on the northwest corner of the Site. A truck stop (Truck Stop) and several other commercial establishments are located along Truck Route 1 and 9 on the northeastern corner of the Site. The Truck Stop and RV Salvage Area were owned by Edwin Siegel and are referred to in documents as the "Siegel property" A former automotive salvage area (Junkyard) was located southeast of the truck stop until the drum removal component of the remedy was implemented during 2001. Property owned by the Archdiocese of Newark (Archdiocese Property) was located in the southeast corner of the Site. The elevated Pulaski Skyway passes over the Site in a west-east direction, toward the truck stop on the northeast corner of the Site.

At the time the Record of Decision (ROD) was issued in 1995, the Site had a variety of owners including the Archdiocese of Newark, Edwin Siegel and Jay Dee Trucking. A large portion (45 acres) of the Site consisted of the Interim Remedial Measure (IRM) cap which covers a heavily contaminated section of the Site (shown on figure 1) and is more fully described in section "*Initial Response*" below. The IRM area was surrounded by a stone lined perimeter ditch which conveyed storm water runoff from the cap to the Hackensack River. The Site had various areas of wetlands, including along the Hackensack River, the Sip Avenue Ditch, and a portion of the IRM perimeter ditch. There was also a separate small freshwater wetland in the southeast corner of the Site. The Site was fenced along the southeast, south, and southwest with a vehicle entrance along Route 1 and 9.

On March 7, 2008, AMB Property, L.P. and AMB Pulaski Distribution Center, LLC together known as AMB purchased about 52 acres of the Site (including most of the IRM cap and the area formerly owned by the Archdiocese of Newark) for construction of a warehouse and transfer station and agreed to construct the remedy on their portion of the Site. A portion of the AMB property along the Hackensack River will become green space which, eventually, will be accessible from the Jersey City portion of the Site by a pedestrian bridge. Construction began in July 2008 and is expected to be completed in 2014. In June 2011, AMB merged with Prologis (AMB/Prologis).

At the time of the AMB/Prologis purchase, Jersey City showed interest in the remainder of the Site for construction of a park. Under an agreement between Jersey City and Waste Management of New Jersey, Inc. and CWM Chemical Services, LLC (together known as CCS), Jersey City agreed to take over the rest of the Site after construction of the landfill cap was completed by CCS. Construction of the cap by CCS began in August 2010 and was completed in January 2012. Jersey City took control of the property in June 2012. At that time, Jersey City became responsible for all activities required by the ROD, including operation and maintenance of the remedy. (Figure 2)

The current land use for the area surrounding the Site is light industrial, parks and residences, and is expected to remain so in the future. Today, a small truck stop and a recycling operation are located adjacent to the landfill along Route 1 and 9 north of the Sip Avenue Ditch. Hartz Mountain, adjacent to the Site on the northeast side, also remains in operation. In addition Jay Dee Trucking borders the Site on the south side and a portion of their operation (about three acres) is

located on the IRM cap portion the Site.

History of Contamination

From about 1970 to 1974, the PJP Landfill Company operated a commercial landfill which accepted chemical and industrial wastes. Although the landfill was closed in 1974, allegations of illegal dumping continued until 1984. As a result of the material in and dumped on top of the landfill, there were frequent fires which produced a lot of smoke.

Geology/Hydrogeology

The PJP Landfill Site is located in the Hackensack Meadowlands which is in the Piedmont Lowland section of the Piedmont physiographic province of northeastern New Jersey. The Site is located on man-made fill deposits which are approximately 10 to 30 feet thick. The fill material is underlain by a discontinuous layer of peat called "meadow mat" that was the original land surface. Below the peat is a layer of unconsolidated glaciolacustrine silts and sand. These are underlain by bedrock which begins approximately 60 to 90 feet below the ground surface.

The bedrock of the Piedmont Lowlands consists of igneous and sedimentary rocks of the Triassic-Jurassic age Newark Supergroup. The bedrock underlying the Site is the Passaic Formation (also called the Brunswick Formation) which consists of fluvial and lacustrine reddish brown shales and some fine grained sandstones.

There are two aquifers in the vicinity of the PJP Landfill. They are the unconsolidated glaciolacustrine silts and sand deposits and the underlying Passaic Formation bedrock aquifer.

Groundwater in the unconsolidated materials is divided into the shallow water-bearing zone (in the man-made fill above the meadow mat) and the deep water-bearing zone (below the meadow mat). Groundwater flow in the shallow zone is controlled by precipitation, topography, tides and manmade structures. The shallow zone has a very high permeability and transmissivity. The groundwater flows toward the Sip Avenue Ditch and the Hackensack River. Groundwater in the deep zone is semi-confined and less likely to be influenced by precipitation. Data from the deep wells shows that some of them are interconnected with the Hackensack River. North of the Sip Avenue Ditch, the water flows west to the Hackensack River. In areas, south of the Sip Avenue Ditch, the deep groundwater aquifer flows south-southwest, also toward the Hackensack River.

Water in the shale and sandstone of the bedrock Passaic Formation occurs under confined and unconfined conditions. In the Piedmont Lowlands of the Hackensack Meadowlands, the bedrock aquifer is generally confined or semi-confined by glaciolacustrine clays and silts.

The principle source of groundwater in the area is from rock units in the Passaic Formation. This groundwater is not used for potable water in the lower Hackensack River Basin but might be used for commercial and industrial purposes. The area near the PJP landfill is served by the Jersey City municipal water supply system, whose water comes from the Boonton Reservoir.

Initial Response

In July 1973, the New Jersey Department of Transportation uncovered steel and plastic drums containing chemicals under the Pulaski Skyway. In 1977, NJDEP issued an order to the PJP Landfill Company to properly cover and grade the landfill and to remove wastes which were in contact with the Hackensack River and the Sip Avenue Ditch. The PJP Landfill Company did not comply with that order.

From 1970 to 1985, there were frequent subsurface fires in a 45-acre portion of the area near the Hackensack River and under the Pulaski Skyway. The fires were attributed to spontaneous combustion of subsurface drums and decomposition of landfill materials. The fires also produced a lot of smoke which resulted in periodic closure of the Pulaski Skyway.

Throughout the early 1980s, NJDEP and the Hudson Regional Health Commission inspected the Site, took samples, and conducted air monitoring. The Site was put on the National Priorities List (NPL) in December 1982. NJDEP was and remains the lead agency for remedial investigations and remedial activities at the Site.

During 1985 and 1986, NJDEP conducted an IRM to deal with immediate threats. Under these activities the landfill fires were extinguished, over one million cubic yards of material were recompacted; grossly contaminated soils were removed as were cylinders and drums containing hazardous materials. These hazardous materials were properly disposed of off-site at secure landfills or destroyed in hazardous waste incinerators. A fire break trench was installed and the 45 acres were regraded, capped, and reseeded. This is referred to as the IRM cap. The IRM cap is comprised of one foot of clay soil compacted over the 45 acres of the landfill and covered by one foot of vegetated topsoil (see Figure 11 of the ROD). A gas venting system consisting of 49 vents was also installed. The IRM was completed in May 1986 and no fires have occurred since then.

In 1988, NJDEP contracted with ICF Technology, Inc. to perform a remedial investigation/feasibility study (RI/FS) on the entire 87-acre Site. The RI was designed to: determine the nature and extent of contamination resulting from historic Site activities, identify potential contamination migration routes, identify potential receptors of Site contaminants, characterize potential human health risks and related environmental impacts, and evaluate any impacts the Site may have on the adjacent Hackensack River. The RI was completed in 1990.

Summary of Results of the Phase I RI and the NJDEP 1993 Sampling Event

During the RI, surface and subsurface soil samples were taken from throughout the Site, except from the capped area. The results of the RI identified contaminants above the existing New Jersey soil cleanup criteria in surface soils, subsurface soils (excluding the test pits) and test pits in the subsurface soils, sediments from the Sip Avenue Ditch. The air samples for the landfill gas vents were also evaluated.

Surface Soil

Surface soil samples were taken from six locations where drums were staged during NJDEP's IRM activities. Volatile organic compounds (VOCs), semi-organic compounds (SVOCs), petroleum hydrocarbons, pesticides and inorganic constituents were detected. Only arsenic was detected in the surface soils above the existing NJDEP Soil Cleanup Criteria of 20 parts per million (ppm).

Subsurface Soil

RI subsurface soil samples were collected from 17 locations above the meadow mat and six locations from below the peat layer during installation of the Site monitoring wells. Composite subsurface samples were collected from twenty test pits completed as part of the buried drum investigation.

In the subsurface soils (outside of the test pits) the following contaminants were detected at levels above the NJDEP cleanup criteria: benzene (maximum concentration of 1.6 ppm), bis (2-ethylhexyl) phthalate (maximum concentration of 180 ppm) and chlorobenzene (maximum concentration of 2.92 ppm).

In the test pits, contaminants were detected more frequently and at higher concentration than in the subsurface soil outside of the test pits. Bis (2-ethylhexyl) phthalate (maximum concentration of 33,100 ppm) and petroleum hydrocarbons were the predominant organic compounds that exceeded the NJDEP subsurface soil standards. Other organic compounds that exceeded the NJDEP impact to groundwater soil cleanup criteria include: benzene (maximum concentration of 250 ppm), dieldrin (maximum concentration of 200 ppm), tetrachloroethene (maximum concentration of 41 ppm) and total xylenes (maximum concentration of 3,900 ppm). Polycyclic aromatic hydrocarbons (PAHs) and inorganics were also frequently detected in the test pit subsurface soils.

Air Samples from the Landfill Gas Vents

During the RI, a preliminary gas screening survey took place using the 49 vents installed in the IRM cap. The maximum flow rate from the 49 vents was used to calculate the potential discharges (8.73 cubic feet per minute). The maximum contaminant concentrations (from three rounds of sampling) were used for each contaminant.

Based on the results of the screening, eight "high emission level" vents were selected for sampling and VOC analyses. All eight vents contained benzene, chlorobenzene, toluene, vinyl chloride, xylenes, and a hydrocarbon pattern similar to gasoline.

Based on the flow rates for the 49 vents along with the average and maximum contaminant concentrations measured in the eight high emission vents, total emissions and total toxic emissions were calculated. The total emissions average was 0.43 pounds/hour (lbs/hr) and the total emissions maximum was1.5 lbs/hr. These values are within the acceptable/allowable limit of 1.5 lbs/hr. The toxic emissions average was 0 .07 lbs/hr which is within the acceptable/allowable limit of 0.1

lbs/hr. However the toxic emissions maximum was 0.27 lbs/hr. which is above the acceptable/allowable limit of 0 .1 lbs/hr.

Sediments

Fourteen sediment samples were collected from the Sip Avenue Ditch, Hackensack River, and a leachate seep area. VOCs, SVOCs and inorganic constituents were found in the Sip Avenue Ditch and the Hackensack River.

Sediment samples from the Sip Avenue Ditch were compared to the National Oceanographic and Atmospheric Administration (NOAA) sediment screening guidelines. These guidelines set criteria for contaminants which are potentially harmful to aquatic life. The contaminants in the Sip Avenue Ditch which exceeded the NOAA guidelines included: total PAHs (maximum 14.8 ppm for carcinogenic PAHs and maximum 30.1 ppm for noncarcinogenic PAHs), antimony (93.8 ppm), cadmium (maximum 6.3 ppm), chromium (maximum 771.0 ppm), copper (maximum 34,000 ppm), lead (maximum 406 ppm), mercury (maximum 5.1 ppm), nickel (maximum 1,260 ppm) and zinc (maximum 9,830 ppm).

Surface Water

Ten surface water samples were collected from the Sip Avenue Ditch and the Hackensack River. The results were compared to the Federal Ambient Water Quality Criteria (AWQC.)

Analyses of the surface water from the Sip Avenue Ditch showed that a number of contaminants exceeded their AWQC. The criteria was exceeded by the following VOCs: benzene, 1,1,1-trichloroethane, chlorobenzene and chloroform, and the following SVOCs: bis (2-chloroethyl) ether and bis (2-chloroisopropyl) ether. Inorganics detected above the criteria include: arsenic, copper, iron, manganese and zinc. Some of these constituents were also found in background monitoring wells at the eastern end of the Site.

Hackensack River samples contained levels of benzene, arsenic, copper, iron, manganese, zinc, mercury, and beryllium above their respective AWQC.

1993 Sampling Event by NJDEP

In the summer of 1993, NJDEP implemented a plan to evaluate existing impact of the Site on the Hackensack River, the deep aquifer beneath the fill material, and the Sip Avenue Ditch. They took samples from three shallow wells and three deep wells as well six surface water and sediment locations. Hackensack River samples were taken both upstream and downstream of the Site. Water and sediment samples were taken from the Sip Avenue Ditch at locations adjacent to Routes 1 and 9 as well as at its confluence with the Hackensack River. The samples were analyzed for organic and inorganic chemical parameters. Also, a series of bioassays (mysid shrimp chronic toxicity tests) were performed at the sediment sample locations and in the waters of the two wells with the highest contamination levels. The results of the 1993 sampling event showed the following:

Surface water

Contamination was found in the Sip Avenue Ditch near Route 1 and 9 and at the confluence with the Hackensack River, with the highest levels found adjacent to Route 1 and 9. Chemicals detected in the water samples include VOCs, such as tetrachloroethene at 44 parts per billion (ppb), and inorganics such as lead and zinc.

Hackensack River water samples both upstream and downstream of the Site contained inorganics such as iron, aluminum, copper and zinc. The fact that contamination was detected both upstream and downstream in the Hackensack River suggests that there may be off-site sources of contamination.

Sediments

Sediment samples from the Hackensack River indicated the presence of VOCs, SVOCs, pesticide, PCBs, and inorganics both upstream and downstream of the Site. The predominant chemicals detected in the sediments include PAHs (maximum about 25 ppm), PCBs (maximum 360 ppb), lead (maximum about 222 ppm) and mercury (maximum about 2.7 ppm).

In the Sip Avenue Ditch, tetrachloroethane, toluene, numerous PAHs, copper, lead and zinc were detected.

Bioassays

A series of bioassay (mysid shrimp chronic toxicity tests) were performed using water collected from the Hackensack River, Sip Avenue Ditch, at the sediment sampling locations and in the water from the two wells with the highest contamination. All four of the bioassay sampling locations in the Hackensack River (including the upstream location), and the Sip Avenue Ditch location from the confluence of the ditch and the river showed significant mortality. These data indicate that potential adverse impacts on biota by these contaminated waters were likely occurring.

Bedrock Wells

The results of the bedrock aquifer well sampling indicated that contaminant levels in all three wells are below the New Jersey Ground Water Quality Standard (NJGWQS) for VOCs, SVOCs, and pesticides.

Groundwater

Groundwater monitoring was conducted at the Site during the RI and by NJDEP in 1993 in order to evaluate impact to the Hackensack River and the deeper aquifer beneath the fill (bedrock aquifer). Results from the three monitoring wells showed that eleven compounds were detected at levels slightly above the NJGWQs.

VOCs tended to increase toward the Hackensack River with the highest levels of VOCs located in both the shallow and deep water-bearing zones of the unconsolidated materials under the IRM cap

area and in the former RV salvage yard. The most common VOCs in the shallow zone were total xylenes, benzene, and chlorobenzene found in the shallow water-bearing zone north of the Pulaski Skyway. In the deep water-bearing zone the most prevalent VOCs were methylene chloride and chloroform. VOCs were not detected in the bedrock wells and the deep water-bearing zone had lower concentrations of VOCs than the shallow water-bearing zone.

For SVOCs, the highest concentrations are also located in both the shallow and deep water-bearing zones of the unconsolidated materials under the IRM cap area and in the former RV salvage yard. The most common SVOCs detected in the shallow zone were naphthalene, phenanthrene, and 2-methyl naphthalene and 4-methylphenol (highest concentration). In the deep water-bearing zone, di-n-butyl phthalate, benzoic acid, acenaphthene, benzyl alcohol, dibenzofuran, phenol, bis (2-chloroethyl) ether and bis (2-chloroisopropyl) ether were detected. Only bis (2-chloroethyl) ether in monitoring well MW-1D (a deep well at the upgradient end of the Site) exceeded the NJ GWQS for a drinking water aquifer.

There were no pesticides, polychlorinated biphenols (PCBs) or dioxins detected in the shallow or deep water bearing zones. Total petroleum hydrocarbons were detected in the shallow water-bearing zone with the highest concentrations found under the IRM cap and in the RV salvage yard. Total petroleum hydrocarbons were not found in the deep water-bearing zone.

Also, during the RI, groundwater from both water-bearing zones was analyzed for total (unfiltered) metals. Inorganics in the shallow water-bearing zone were found under the IRM cap, the RV salvage yard, the Pulaski Skyway and the southern area of the Site. The metals that were detected above the NJGWQS were aluminum, antimony, arsenic, cadmium, mercury, thallium, lead, chromium, manganese, nickel, iron and sodium. In the deep water-bearing aquifer, the metals detected above the NJGWQS include aluminum, arsenic, iron, lead, manganese, silver, and sodium. Since unfiltered metal samples were not taken, NJDEP was not able to determine if the concentration of metals were from suspended particulates or dissolved in the groundwater.

Basis for Taking Action

The RI and 1993 sampling event identified contaminants above the existing NJDEP cleanup criteria in surface soils, subsurface soils, sediments from the Sip Avenue Ditch, and air. In addition, the portion of the Site where the fires occurred are now covered by an interim action and a final remedy is necessary.

Human Health Risk

Various exposure scenarios were evaluated based on current and potential future land use. Based on the baseline risk assessment, the greatest risk associated with the Site was the incidental ingestion and dermal absorption of chemicals in sediment by trespassing children wading in the Sip Avenue Ditch. The carcinogenic risk for children was estimated to be 4×10^{-5}.

If the Site was developed, on-site construction workers could be exposed via direct contact with contaminated sediments, subsurface soil, materials in test pits or air from gas vents. Generally, the

concentrations of chemicals detected in test pits and subsurface soils are substantially higher than in sediments which could result in unacceptable risks to on-site workers.

Ecological Risk

The environmental assessment provided a qualitative evaluation of the actual or potential impacts from the Site on plants and animals. The environmental assessment identified several endangered species and sensitive habitats in the vicinity of the Site. It concluded that chemical contamination detected during the RI is not expected to have significant impacts on plants or terrestrial wildlife, but may be impacting aquatic life.

For plants, the chemical-related impacts were not expected to be significant and were likely to be limited to contamination source areas (e.g., the drum disposal area) since surface soil contamination is not widespread.

Potential impacts were evaluated for terrestrial wildlife. Some species could use the Sip Avenue Ditch or Hackensack River. However, exposure was not expected to be significant since there are other water sources nearby and these species have a large foraging area. None of the chemicals of potential concern detected in the surface water are expected to be acutely or chronically toxic at the levels of exposure at the Site.

Aquatic life was exposed to contaminated surface water and sediments and potential impacts were evaluated. There was a potential for food chain effects to occur due to predation on aquatic species since several of the contaminants, such as cadmium and mercury, bioconcentrate. Several contaminants in surface water and sediments in the Sip Avenue Ditch and Hackensack River exceed their respective toxicity vales, suggesting that aquatic life may be impacted.

IV. Remedial Actions

Based on the results of the pre-RI investigation, the RI, 1993 monitoring event and the risk assessment, feasibility studies (FS) were prepared by the contractor for NJDEP. The Phase I FS report was completed in November 1989, the Phase II FS report was prepared in May 1993 and the Phase III report was prepared in July 1993. NJDEP, with EPA's concurrence, issued a ROD on September 28, 1995.

Remedy Selection

The Remedial Action Objectives (RAOs) for the remedy are:

- Eliminate exposure to contaminated sediments in the Sip Avenue Ditch;
- Prevent additional contaminant influx into the groundwater via infiltration of rain water;
- Removal of contaminant sources that may impact groundwater; and

- Evaluate if future actions are necessary to mitigate the leaching of Site contaminants into the Hackensack River through monitoring and modeling to check the effectiveness of the remedy. If significant adverse impact is found, NJDEP and EPA will evaluate remedial alternatives and select an appropriate remedy in accordance with CERCLA and the NCP.

The major components of the 1995 ROD included:

- Removal of all known and suspected buried drum materials and associated visibly contaminated soil;

- Capping of the remaining landfill area of the site with a multi-layer modified solid waste cap in accordance with the NJDEP Bureau of Landfill Engineering Guidance with gas venting;

- Extension of the existing gravel lined ditch around the perimeter of the site to collect the surface water runoff;

- A passive or active gas venting system installed in the new portion of the cap (If an active system is deemed necessary, however, both areas will be included);

- Site fencing and institutional controls (e.g., declaration of environmental restriction and public information program);

- Quarterly inspection and maintenance, and a re-evaluation of the previously capped area;

- Replacement of the Sip Avenue ditch with an alternate form of drainage;

- Quarterly ground water monitoring to evaluate the reduction of contaminant concentrations over time;

- Modeling to demonstrate the effectiveness of the cap by predicting the impact of ground water leachate migrating to the Hackensack River from the landfill;

- Because contamination levels in the ground water are above the Class IIA Ground Water Quality Criteria (GWQC), a Classification Exemption Area(CEA)/Well Restriction Area (WRA) will be established; and

- Implementation of a wetlands assessment and restoration plan. (The wetlands assessment will be performed prior to implementation of any of the remedial actions).

Remedy Implementation

After the ROD was issued, NJDEP and two potentially responsible parties (PRPs), CWM Chemical Services, L.L.C. (CCSL) and Waste Management of New Jersey (WMNJ) collectively referred to as "CCS", entered into an administrative consent order (ACO) in June 1997 and

amended the agreement in September 1997 (together referred to as the original ACO) for remedial design and remedial action (RD/RA).

The original ACO was amended in June 2000 (First Amendment) to implement the remedy selected in the ROD, as more specifically defined in the statement of work. The ACO was further amended in March 2008 (Second Amendment) to reflect the purchase of a portion of the Site by AMB, and again in June 2011 (Third Amendment), to reflect the purchase of another portion of the Site by Jersey City.

EPA entered into a Consent Decree with numerous parties for past costs which was entered on January 17, 2002, and has since been closed.

Pre-Design Investigation

As part of the remedy, the PRP's contractor (Golder Associates) conducted a pre-design investigation (PDI). The PDI included the following activities: preparation of an updated topographic base map (including cross-sections of the Sip Avenue Ditch); wetlands delineation and assessment; landfill gas evaluation; IRM cap inspection; storm water evaluation; conceptual design for the Sip Avenue Ditch; preparation of a drum removal work plan; pre-remedial baseline groundwater and surface water quality monitoring and preparation of a Classification Exception Area/Well Restriction Area (CEA/WRA) application.

Fence Evaluation and Boundary Assessment

As part of the PDI, the fence surrounding Site was inspected. Portions of the fence to the south of the Site were covered with overgrown vegetation and other sections were damaged by trespassers. The fence line along Route 1 and 9 was in poor condition, with portions cut and damaged. The fence line that enclosed the Junkyard restricted vehicles but not foot traffic. The Truck Stop is still active and the property owner provides security. Access to the RV Salvage is only available through the Hartz Mountain entrance, which is guarded. The 2007 Final Remedial Design Report recommended that the areas to be capped be enclosed by combination of fence and natural barriers such as the Hackensack River.

The boundary assessment was undertaken to determine the appropriate boundaries of the planned landfill cap. A series of historical aerial photos were analyzed and based on this assessment, the cap boundaries were determined. The assessment showed that Truck Route 1 and 9, trucking operations along Duncan Avenue (south of the Site) and the Truck Stop/Hartz Mountain warehouse to the north of the Site existed before landfill operations began at the Site in 1968. Therefore it is unlikely that landfill material extends onto these adjacent areas. Also, the Truck Stop and Recycling Facility located along Route 1 and 9 and northeast of the Sip Avenue Ditch is not part of the Site, even though it was formerly included in the Site during the RI. These areas will not be included in the landfill cap.

Drum Removal

During the PDI, drums and related materials such as soils visually stained by drum contents were removed. Most of this took place in two areas of the Site: the Auto Junkyard Area to the south of the Sip Avenue Ditch, and a smaller area to the north of the Auto Junkyard Area and beneath the Pulaski Skyway.

The excavation activities began in February 2001 and were completed in April 2001. A total of 10,776 drums, including 17 intact drums with contents, and drum remnants were recovered. This material was transported off-site and disposed of properly. Soil which was excavated as part of the removal was analyzed and, if hazardous, was disposed of off-site. Wastewater and decontamination water from these activities were analyzed, found to be non-hazardous and disposed of off-site.

About one foot of clean fill was placed in the excavated areas to protect the groundwater. The areas were then covered with excavated soils that were determined to be non-hazardous. The area was graded to facilitate drainage and erosion control.

Topographic Base Map

A topographic base map was generated from an aerial fly over on November 2, 1998. Horizontal and vertical control points were used to tie the base map into the New Jersey Coordinate Grid System.

Wetlands Delineation and Assessment

The wetlands delineation was completed in April 2001. It showed the existence of wetlands in the IRM perimeter ditch of approximately 0.15 acres and in the entire Sip Avenue Ditch which covered 2.03 acres. There also was a fringe of wetlands along the Hackensack River of approximately 0.04 acres. A 0.8 acre freshwater wetland was found in the southeastern corner of the Site. During implementation of the remedy, the 0.8 acre freshwater wetland will be removed from its current location and recreated at the junction of the redesigned Sip Avenue Ditch and the Hackensack River.

For the wetlands assessment: surface water, sediment and biota samples were taken from the Site and compared to three background samples taken from the New Jersey Natural Lands Trust area approximately 2.6 miles upriver from the Site. The sampling data was screened using eco-toxicological benchmarks and showed the presence of eleven PAH compounds and ten inorganics at levels of concern at the Site. Most of these contaminants were also found above the levels of concern in the background samples. These constituents may not be Site-related

However, some contaminants were found in sediment samples in the Sip Avenue Ditch. These samples showed the presence of chromium, lead, nickel and zinc at levels that have the potential to cause adverse effects to the aquatic life. Contaminants from samples in the Sip Avenue Ditch are likely to be Site-related. Those constituents will be remediated as part of the remedy for the Sip

Avenue Ditch.

Landfill Gas

The need for an active or passive gas management system for the landfill remedy was evaluated using the following criteria: field measurements of gas quality and quantity; possibility of off-site migration of gasses to potential receptors; theoretical life cycle gases calculations; and potential end use of the Site. The results of this evaluation were compared to data collected during the RI to determine how to manage gas generated by the content of the landfill after the full cap is installed.

Four sampling events were conducted in the spring and summer of 2001 and average concentrations of VOCs were calculated. Only benzene and chloroform were detected at some of the sampling locations. All VOCs detected during the PDI were below the concentrations measured during the RI.

Since the VOC levels measured during the PDI were below the RI levels, and the calculated emission rates were below the NJDEP limit of 0.1 lb/hr, and other calculated values are low, it was concluded that an active landfill gas extraction system is not needed. The landfill cap, which is part of the remedy, requires only a passive system to be sampled periodically.

IRM Cap Evaluation

The IRM Cap was visually evaluated in September 1998 and June 2011 to identify areas of cover soil erosion, exposed waste or poor vegetation cover. In general, the landfill cover was in good condition. There were areas of poor vegetation beneath the Pulaski Skyway, possibly due to the lack of sunlight. These areas were reseeded in 2002.

Stormwater Evaluation

The storm water evaluation was completed in June 2001. It was conducted in order to understand drainage at the Site and design a storm water management system for the remedy. Drainage at the Site consists of IRM perimeter ditch which collects runoff from the IRM cap, the Hackensack River and the Sip Avenue Ditch.

At the time of the evaluation, the IRM perimeter ditch was functioning as designed although there was vegetation, sediment buildup and debris in the ditch. The Sip Avenue Ditch conveyed runoff to the Hackensack River from portions of the IRM cap, the Archdiocese and Junkyard Area, the Truck Stop and the RV Salvage Area as well as for discharge from the Jersey City Storm Sewer at the intersection of Sip Avenue and Truck Route 1 and 9.

Groundwater and Surface Water Samples

All groundwater samples were compared to the NJGWQC for Class II-A aquifers. There was a concern that the detection of metals was due to suspended particles. Therefore, in 2001, all monitoring wells were redeveloped and sampled using low flow sampling methods.

The surface water samples from the Sip Avenue Ditch and Hackensack River were compared to the NJSWQS. Only ethers were found above its NJSWQS and those exceedances were found in the Sip Avenue Ditch.

Most of the exceedances in shallow groundwater were from samples under the IRM cap or in the eastern portion of the Site. Constituents which exceeded the NJGWQC included benzene, chlorobenzene, ethers, iron, manganese, barium, and lead.

In samples from wells in the deep water-bearing zone in 2001, inorganics were detected either below the NJGWQC or below background levels for the first two rounds of sampling. Concentrations of some inorganic constituents (ex. calcium and sodium) were greater at the down gradient end of the landfill. This was attributed to interaction with the Hackensack River because Hackensack River samples contained higher concentrations of those elements.

Next Steps

The above data was used to design the landfill cap over the entire Site. The Final Design Report for the cap and other elements of the remedy was submitted by CCS on April 4, 2007 and approved by NJDEP and EPA on July 26, 2007. Some elements, such as the drum removal, were implemented during the PDI.

Construction of the cap and other elements of the remedy in the approved Design Report were delayed because outside parties began to show interest in purchasing and redeveloping the Site.

Changes in Ownership of the Site and Revision of Elements of the Remedy

AMB/Prologis

On March 7, 2008, AMB Property, L.P. and AMB Pulaski Distribution Center, LLC together known as AMB, bought approximately 51.76 acres of the Site (formerly owned by the Archdiocese of Newark) (Figure 2). At that time, AMB assumed remedial obligations by entering into an ACO with NJDEP. On March 7, 2008, NJDEP modified their existing ACO with CCS to reflect the change in ownership for portion of the Site. CCS was now responsible for the remedy on the remaining portion of the Site.

This majority of the AMB property will be capped through the construction of a warehouse and transfer station and associated impervious cover. A portion of their property, which borders the Hackensack River, will be given to Jersey City as green space. AMB submitted a revised design for the cap which was approved by EPA and NJDEP on July 24, 2008. AMB first mobilized in July 2008. In June 2011, AMB was purchased by Prologis, who assumed full responsibility their portion of the Site. The construction of the warehouse and transfer station is ongoing and is expected to be completed in 2014.

Jersey City

Shortly after AMB purchased a portion of the Site, Jersey City, where the Site is located, expressed interest in obtaining the remaining 32 acres of the Site then owned by Edwin Siegel (Figure 2). In order to do so, NJDEP, Jersey City and CCS agreed that CCS would construct the landfill cap on the 32 acres. Upon completion of the cap, Jersey City would take posession of the area and become responsible for all operation and maintenance activities.

In November 2009, Malcolm Pirnie, the contractor for Jersey City, submitted a plan to modify the landfill cap plan previously submitted by CCS and approved by NJDEP and EPA. This modification changed the slopes of the landfill cap in order to maximize the amount of the level surface at the top of the landfill for the proposed beneficial reuse of the Jersey City property as a public park. This new plan was called the "Closure Equivalency Engineering Report" and was approved by NJDEP and EPA on February 5, 2010.

CCS began construction of this portion of the cap on August 18, 2010 and was completed on January 5, 2012. The construction completion report (titled "Construction Quality Assurance Final Report") was submitted February 14, 2012 and was approved by NJDEP and EPA on May 18, 2012. The final Operation and Maintenance Plan was submitted on August 22, 2012 and approved on September 11, 2012.

Under the Third Amendment to the ACO with CCS and the City of Jersey City's Memorandum of Understanding with NJDEP, both dated June 21, 2011, Jersey City assumed environmental obligations associated with this portion of the Site upon CCS's completion of the final capping activities.

Jay Dee Trucking

The Jay Dee Trucking operation is located adjacent to the southeast corner of the Site. They began storing empty trailers on an area of approximately three acres on the IRM cap. In addition, NJDEP found that during an inspection conducted on May 6, 2008 Jay Dee Trucking had installed light poles, installed a fence, installed additional capping material, destroyed groundwater monitoring wells and removed gas vents. Therefore, they became PRPs for the three acres and are responsible for a portion of the Site remedy.

Based on the June 2010 Gas Vent Sampling and Analysis Report, NJDEP and EPA agreed that no further monitoring of the gas vents (from the IRM cap) on the Jay Dee Trucking property is necessary. However, they remain responsible for soil and groundwater under the IRM cap. They will obtain Remedial Action Permits for the soil and groundwater as described below.

Summary of Changes

Although the design elements of the cap selected in the ROD was modified by the new owners of portions of the Site, the elements of the remedy were not changed. The entire PJP Landfill will be capped. AMB/Prologis will construct one portion of the cap, which has been modified to accommodate their reuse of the property and CCS has done the same to accommodate reuse of the

property by Jersey City. The AMB/Prologis portion of the cap is currently under construction. CCS has completed their portion of the cap and has left the area of their cap which borders the AMB/Prologis property, ready to seal with the AMB/Prologis cap.

Wetlands Mitigation

The entire Sip Avenue Ditch is located on the Jersey City portion of the Site. During construction, the ditch was lined with the same material as the landfill. The ditch was also widened and native vegetation was planted along its slopes. Wetlands were also restored along the Hackensack River after that portion of the landfill was completed. As noted during the wetlands mitigation and assessment portion of the PDI, the 0.8 acre freshwater wetland was removed from its near Route 1 and 9 on what is now the AMB/Prologis portion of the Site. The 0.8 acres of wetland were added to the junction of the redesigned Sip Avenue Ditch and the Hackensack River which is now also on the Jersey City portion of the Site.

Wetlands restoration along the Hackensack River on the AMB/Prologis portion of the Site will take place after construction activities are complete.

Institutional Controls

Since waste is left in place throughout the PJP Landfill Site, each owner of a portion of the Site (AMB/Prologis, Jersey City and Jay Dee Trucking) is required to file a deed notice along with paperwork to define a CEA and a WRA. Each owner must also obtain Remedial Action Permits for soil and for groundwater, as well as file any necessary future reports.

The CEA/WRA for the PJP landfill Site as a whole was established on April 26, 2001 and modified by CCS on July 29, 2008, after AMB/Prologis purchased a portion of the Site. It has since been revised to reflect the changes in ownership.

Jersey City filed a Deed Notice on May 29, 2013. In a May 30, 2013 letter from NJDEP to Jersey City's contractor (Dresdner Robin), NJDEP determined that although Jersey City will eventually need to file the paperwork to establish a CEA/WRA, there is not yet enough groundwater data to do so. Jersey City was directed to conduct an additional six rounds of quarterly sampling (for a total of eight) before submitting a revised CEA/WRA.

The CEA/WRA for the AMB/Prologis portion of the Site was approved on July 18, 2008. A Deed Notice will be filed after the final construction completion report is approved. The current construction schedule estimates this will occur in 2014.

The CEA/WRA for Jay Dee Trucking was approved on August 18, 2010 and the Deed Notice was filed on January 20, 2011.

V. Progress Since the Last Five-Year Review

This is the first five-year review.

VI. Five-Year Review Process

Administrative Components

The five-year review team consists of Renee Gelblat (EPA, RPM), Kate Mishkin (EPA, hydrogeologist), Rebecca Ofrane and Chloe Metz (EPA, risk assessors for human health), and Mindy Pensak (EPA, ecological risk assessor).

Community Involvement

EPA published a notice on the Jersey City website, on May 6, 2013 notifying the community of the initiation of the five-year review process.

Document Review

The documents, data, and information which were reviewed in completing this five-year review are summarized in Table 2.

Data Review (Post-PDI sampling)

In March 2008, AMB/Prologis purchased a portion of the PJP landfill site and since that time the Site has been divided into two main parts with separate owners. Each owner has full responsibility for implementation of the selected remedy on their property.

Groundwater

The ROD requires that monitoring wells are sampled on a quarterly basis. Such sampling has taken place, except during construction activities. Figure 3 shows the location of the monitoring wells.

The contaminants found in the groundwater, surface water, and sediments have been found throughout the Site. The COCs in groundwater include: benzene, chlorobenzene, PCE, iron and manganese and 1,4-dioxane. The COCs found in surface water and sediments include PAHs and inorganics, principally benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluorine, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, manganese and copper. The details of sampling on each portion of the Site are described below.

Groundwater Sampling on the Jersey City Property

Prior to construction of the remedy on the Jersey City portion of the Site, CCS sampled the seven groundwater monitoring wells quarterly in 2008, 2009, 2010 and 2011. Sampling was suspended during construction of the remedy. After the remedy was completed in January 2012, quarterly sampling resumed in December 2012. That sampling event showed exceedances of benzene, chlorobenzene, manganese and iron. A groundwater sampling event also took place in March 2013 but the results were not available for this five-year review.

Groundwater samples could not be collected from MW-12S because a dense non-aqueous phase liquid (DNAPL) was discovered in the well during the December 2012 sampling event. As a result, NJDEP required the PRPs to inspect seeps along the riverbank since MW-12S is situated in close proximity to the Hackensack River. In addition the DNAPL in the well was evacuated four times, and samples were sent to a lab. The DNAPL was analyzed and contained quinolines and other polar oxygen containing compounds. These constituents are indicative of a dye and are likely a combination of industrial and medical waste. This well will be monitored in subsequent quarterly sampling events.

Groundwater Sampling on the AMB/Prologis Property

Quarterly sampling of monitoring wells on the AMB/Prologis portion of the PJP Landfill took place in April, July, Oct of 2008 and some wells were also sampled in 2010. Upon initiation of construction activities, AMB/Prologis and NJDEP agreed to the temporary abandonment of five on-site monitoring wells and the permanent abandonment of four on-site monitoring wells.

Prior to construction, there were exceedances of benzene and chlorobenzene in some of the wells. The chemical 1,4-dioxane was added to the sampling list in April 2010 has only been sampled once, in July 2010. 1,4-dioxane was found in concentration up to 6,600 µg/L in the shallow water-bearing zone. It was also present but found in lower concentrations in the deep water-bearing zone. Construction is scheduled to be completed in 2014 at which time quarterly sampling will resume.

Surface water

Surface water samples are collected quarterly from three co-located surface water and sediment locations along the remediated Sip Avenue Ditch and two in the Hackensack River adjacent to the Site. Sampling locations in the Hackensack River include one that is upgradient of the Site, to the north of the Jersey City property and downgradient of the Site, to the southwest of the AMB/Prologis property. The Sip Avenue Ditch conveys run-off from the Site as well as from the Jersey City storm water/sewer system and is tidal for the full length of the ditch.

The principal contaminants of concern that have been detected in surface water include PAHs and inorganics. PAHs most commonly detected include: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluorine, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene. Common metal exceedances of arsenic, manganese, and copper have been found.

PAHs exceeded surface water standards at all sampling locations, including upgradient of the Site. This suggests some contribution from non-site sources. Manganese concentrations exceeded surface water criteria in both the Hackensack River and the Sip Avenue while arsenic and copper concentrations exceeded surface water criteria only in samples collected in the Hackensack River.

Sample data were also screened against NJDEP ecological screening criteria for saline surface water and exceedances of copper, lead and zinc (January 2012) and arsenic, lead, mercury, and zinc (December 2012) were noted. However, at this time, there is no clear pattern of inorganic exceedances as the ditch is tidal. Exceedances were seen throughout the Sip Avenue Ditch as well as the two locations within the Hackensack River.

Surface water sampling will continue after all construction at the Site has been completed.

Vapor Intrusion Investigation

Currently, there are no buildings on the Site. A large warehouse and transfer station is under construction on the AMB/Prologis portion of the property. Although groundwater concentrations on the AMB/Prologis portion remain above levels that could potentially cause vapor intrusion to occur, the building design includes a low permeability cap and venting system in its base. This is designed to act as a vapor barrier.

Recently, Jersey City submitted a vapor intrusion evaluation of the Hartz building (a large warehouse and trucking facility located adjacent to the Jersey City portion of the Site). This is the only building in close proximity to the site that may be impacted by Site related vapor intrusion. Jersey City concluded that the well closest to this building (MW-18S, which is 94 feet from the edge of the Hartz foundation) had concentrations of benzene and vinyl chloride slightly above New Jersey Groundwater Screening Levels. Given the distance of this well from the building, Jersey City proposed evaluating two additional rounds of groundwater data before making the determination to do any further vapor evaluation. NJDEP and EPA agreed with this proposal.

Site Inspection

An inspection of the Site was conducted on May 16, 2013 by the EPA RPM, human health and ecological risk assessors and hydrogeologist. Officials from Jersey City and AMB/Prologis, along with their respective contractors also attended.

The purpose of the inspection was to assess whether the remedies are functioning as designed, and to determine whether current conditions at the Site are protective of human health and the environment.

Construction on the Jersey City portion of the Site has been completed and access is controlled with a locked fence which is in good condition. Current plans for this portion of the Site include a nature center and a park. In the future, a pedestrian bridge will be constructed over the Sip Avenue Ditch at its confluence with the Hackensack River to connect the park to the portion of the AMB/Prologis property along the Hackensack River which was donated to Jersey City.

New plant growth is evident along the banks of the Sip Avenue Ditch. At the time of the Site visit, the vegetation, including plantings in the reconstructed wetlands, were less than a year old and had not yet been subjected to winter weather. The vegetation will be monitored over the winter and its

condition evaluated in the spring. Vegetation will be replaced as necessary.

There are long pipes hang from the Pulaski Skyway which are used to drain rainwater from the Skyway. These pipes drop water onto squares of gravel on the Site. The gravel was placed there to prevent erosion of the vegetation overlying the cap under the Skyway. The rainwater then infiltrates the Site and moves to the Sip Avenue Ditch and, eventually to the Hackensack River.

The AMB/Prologis portion of the Site is an active construction area. The area is fully fenced and there is security at all times.

Interviews

Renee Gelblat of EPA has discussed ongoing activities at the site with the five-year review team, the owners of the Site and officials from Jersey City. EPA also placed a notice on the Jersey City web site on May 6, 2013. The city officials had no comments and EPA did not receive comments from the public. There were no issues or concerns raised about the protectiveness of the remedies in place or under construction at the Site.

Other Comments on Operation, Maintenance, Monitoring and Institutional Controls

Table 3 presents several comments and offers suggestions for their resolution.

VII. Technical Assessment Summary

Question A: Is the remedy functioning as intended by the decision documents?

The remedy called for eliminating exposure to contaminated sediments in the Sip Avenue Ditch and preventing additional contaminant influx into the groundwater via infiltration. The installation of the cap on the Jersey City portion of the Site, which includes the Sip Avenue ditch, effectively does this. The cap on the AMB portion of the property is currently being constructed. Once construction in complete, the entire site will be covered by a low permeability cap that will eliminate all current and future direct contact exposure pathways. Air emissions from the IRM portion of the site have decreased significantly since the RI, such that the PRPs have asked for the venting system to be decommissioned. This will eliminate the air exposure route as well.

As discussed in the 2007 *Final Design Report*, drums were discovered and removed from beneath the Pulaski Skyway in 2001, north of the Sip Avenue ditch (Jersey City portion). Along with the drums, soil was removed and soil classified as hazardous under RCRA was disposed of offsite. The area was backfilled with a foot of clean fill above the shallow water-bearing unit and then the soil which was removed during the drum removal event and not determined to be hazardous was placed above the clean fill. No post-removal samples were collected. However, the *Construction Quality Assurance Final Report* shows that this area was capped as part of the remedy.

Although the remedy is not fully implemented, the NJGWQS are used to evaluate the effectiveness of the cap at preventing groundwater infiltration. Concentrations are currently in exceedance of these standards across the site; however, a CEA for the shallow groundwater is in place, ensuring that groundwater will not be available for consumption. The need for a CEA for the deeper groundwater should be explored once the remedy is complete based on the preliminary 1,4-dioxane results discussed above. Surface water and sediment samples will be collected quarterly upon remedy completion. These sample locations will serve as compliance monitoring points to ensure that contaminated groundwater is not impacting the Hackensack River and the Sip Avenue ditch. An evaluation of existing surface water data indicates that although site-related compounds (primarily PAHs) are present in surface water, there does not appear to be widespread impacts from the Site.

The landfill cap is expected to eliminate any potential ecological risks from surface soil contaminants to terrestrial receptors. The Sip Avenue Ditch, which is also included within the landfill cap, is similarly expected to eliminate risk to aquatic receptors (from sediment and surface water) as identified during the remedial investigation process. Surface water data from the December 2012 and January 2013 events show exceedances of inorganics. However the ditch carries storm water drainage and is tidal and therefore there is no pattern of site-related exceedances established throughout the ditch or the Hackensack River.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The cleanup levels and remedial action objectives used at the time of the remedial action remain valid. 1,4-dioxane was included in the original contaminant list and was added to the sampling list in 2010. It has been included in recent sampling events for groundwater and surface water and will continue to be evaluated.

The baseline risk assessment evaluated the health effects that could potentially result from ingestion of and dermal contact with soils, sediment, and surface water by site trespassers and workers, as well as inhalation of landfill gases by these receptors. Ingestion of groundwater by hypothetical future residents was also evaluated. The exposure assumptions and toxicity values that were used to estimate potential cancer risks and noncancer hazards for these pathways in the 1995 ROD followed the Superfund risk assessment process at the time and remain valid.

The vapor intrusion pathway was not evaluated during this five-year review. Currently, there are no buildings on the Site and a large warehouse and transfer station is under construction on the AMB/Prologis portion of the property. Although groundwater concentrations on the AMB/Prologis portion remain above levels that could potentially cause vapor intrusion to occur, the building design includes a low permeability cap and venting system in its base which is designed to act as a vapor barrier.

Recently, Jersey City submitted a vapor intrusion evaluation of the Hartz building (a large warehouse and trucking facility located adjacent to the Jersey City portion of the Site). This is the only building in close proximity to the site that may be impacted by Site related vapor intrusion. Jersey City concluded that the well closest to this building (MW-18S, which is 94 feet from the

edge of the Hartz foundation) had concentrations of benzene and vinyl chloride slightly above New Jersey Groundwater Screening Levels. Given the distance of this well from the building, Jersey City proposed evaluating two additional rounds of groundwater data before making the determination to do any further vapor evaluation. NJDEP and EPA agreed with this proposal.

An ecological risk assessment was conducted to support the 1995 ROD and its assumptions remain valid. The assessment concluded that there was a potential for food chain effects to occur due to predation on aquatic species since several of the contaminants, such as cadmium and mercury, bioconcentrate. Several contaminants in surface water and in sediments in the Sip Avenue Ditch and Hackensack River exceed their respective toxicity vales, suggesting that aquatic life may be impacted. The Sip Avenue Ditch as been lined with the landfill material cap and its surface water continues to be monitored to evaluate leachate impacts.

Question C: Has any other information come to light that could call into question the protectiveness of the remedies?

The remedy has not been fully implemented. At this time there is no information that could call into question the protectiveness of the remedy.

At the time of the Site visit, the vegetation, including plantings in the reconstructed wetlands had only recently been planted (less than a year). Spartina and other plants should be monitored at a minimum frequency of semi-annually and quantitative success criteria should be included in a wetlands monitoring plan. Towards the mouth of the Sip Avenue Ditch (where it meets the Hackensack River), some of the Spartina plantings appeared to be sparse. Adaptive management will be considered in the event that this area fails to thrive.

VIII. Recommendations and Follow-up Actions

The remedy has not been fully implemented. There are no comments, issues, suggestions or recommendations concerning the remedy.

IX. Protectiveness Statement

The remedy is expected to be protective of human health and the environment upon completion. In the interim, response activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

X. Next Review

The next five-year review for the PJP Landfill should be completed by September 2018.

Table 1: Chronology of Site Events	Date
Landfill activities conducted at the Site	1970 - 1974
NJDEP issued an order to PJP Landfill Company to properly cover and grade the landfill	1977
Periodic surface fires occur in 45 acre area under the Pulaski Skyway and near the Hackensack River	1970-1985
Final listing on EPA's National Priorities List	12/1982
NJDEP conducts Interim Remedial Measures to extinguish fires and remove immediate hazards	1985-1986
NJDEP begins Remedial Investigation/Feasibility Study	1988
Remedial Investigation completed	1990
Phase III Feasibility Study completed	7/22/1993
1993 Sampling event for groundwater and surface water	1993
Record of Decision for Operable Unit One issued	9/28/1995
Administrative Consent Order with CCS (Original ACO)	6/2/1997, amended on 9/29/1997
ACO amendment modified for Remedial Design and Remedial Action with more specific Statement of Work	6/15/2000
EPA Consent Decree for Past Costs Entered	1/17/2002
Pre-Design Investigation	2001-2004
Drum Removal	2/2001-4/2001
Approval of Final Design Report by EPA and NJDEP	7/26/2007
AMB purchases about 51 acres south of Sip Avenue Ditch and signs ACO with NJDEP to assume remedial obligations.	3/7/2008
NJDEP issues ACO with CCS modified to state that AMB has assumed all environmental responsibilities for the portion they have purchased.	3/7/2008
AMB revised remediation action plan approved	7/24/2008
AMB mobilizes	7/24/2008

Table 1: Chronology of Site Events (cont'd)	Date
Closure Equivalency Engineer Report to modify the remedial action on the CCS portion of the Site approved	2/5/10
ACO with CCS modified to state that Jersey City will assume all environmental obligations not on-AMB's portion of the Site upon CCS's completion of final capping activities	6/21/2010
Jersey City signs Memorandum of Understanding with NJDEP to assume all environmental obligations on the non-AMB portion of the Site upon CCS's completion of final capping activities	6/21/2010
Construction of CCS portion of the cap	8/18/2010-1/5/2012
Prologis purchases AMB	6/3/2011
NJDEP approves modification to the remedial design to give permanent easement to Hartz Mountain for their trucking operations	6/2011
Construction Completion Report Approved ("Construction Quality Assurance Final Report") for CCS portion of the Site	5/18/2012
Operation and Maintenance Plan for Jersey City approved	9/11/2012

Table 2: Documents, Data, and Information Used in Completing Five-Year Review
• Phase I Remedial Investigation Report, ICF Technology, April 1990
• Phase III Focused Feasibility Study Report, ICF Technology, July 1993
• Proposed Plan, NJDEP, August 1994
• Operable Unit One Record of Decision, NJDEP, September 1995
• Final (100%) Design Report, Golder Associates, April 2007
• Amended Remedial Design Report (for AMB Pulaski Distribution Center, LLC), Sadat Associates, June 2008
• Annual Groundwater Monitoring Report for the PJP Landfill for CCS for 2008, 2009, 2010, and 2011, Golder Associates, 2008, 2009, 2010, and 2011
• Closure Equivalency Engineer Report (to modify the remedial action on the CCS portion of the Site for Jersey City), Malcolm Pirnie, Inc., November 2009
• Annual Groundwater Monitoring Reports for the AMB Pulaski Distribution Center, LLC, for 2009 and 2010, Sadat Associates, June 2010 and March 2011
• Construction Quality Assurance Final Report (construction completion of the Jersey City portion), Geosyntec Consultants, February 2012
• Final O&M Plan for Jersey City, ARCADIS, August 2012.
• Quarterly Groundwater Sampling Report for the Marion Greenway, ARCADIS (formerly Malcolm Pirnie), December 2012
• Comments from Kate Mishkin, EPA Hydrogeologist, May 2013
• Comments from Mindy Pensak, EPA Eco Risk Assessor, June 2013
• Comments from Chloe Metz, EPA Risk Assessor, August 2013
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Table 3: Other Comments on Operation, Maintenance, Monitoring and Institutional Controls	
Comment	**Suggestion**
On the Jersey City portion of the Site, MW-18S has benzene and vinyl chloride levels above the NJ Groundwater Screening Levels. This could result in a vapor intrusion problem in the nearby and off-Site Hartz Mountain Facility.	Jersey City proposed evaluating two additional rounds of groundwater sampling before making a determination to conduct any further vapor intrusion evaluation. NJDEP and EPA agreed with this proposal.

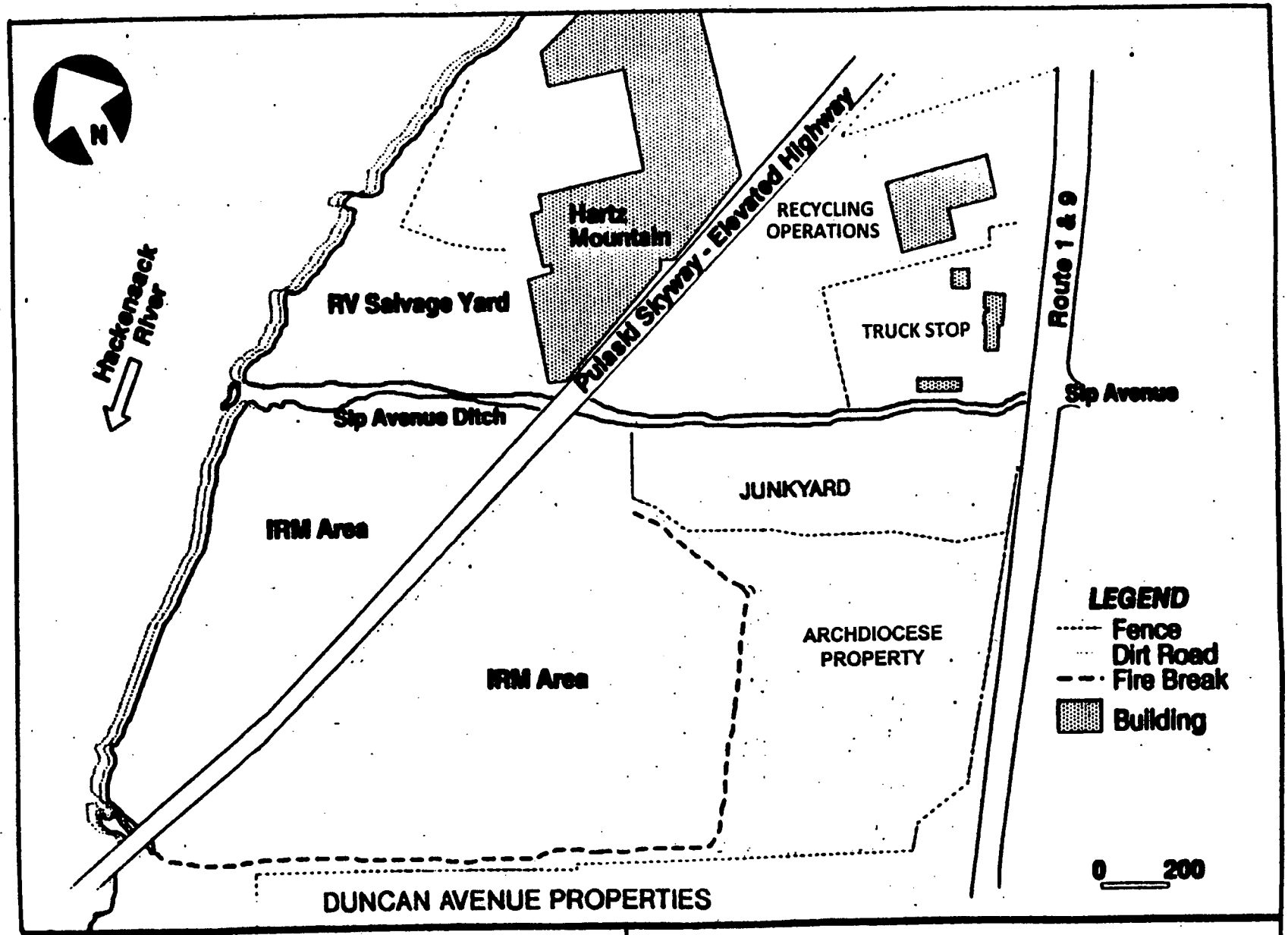
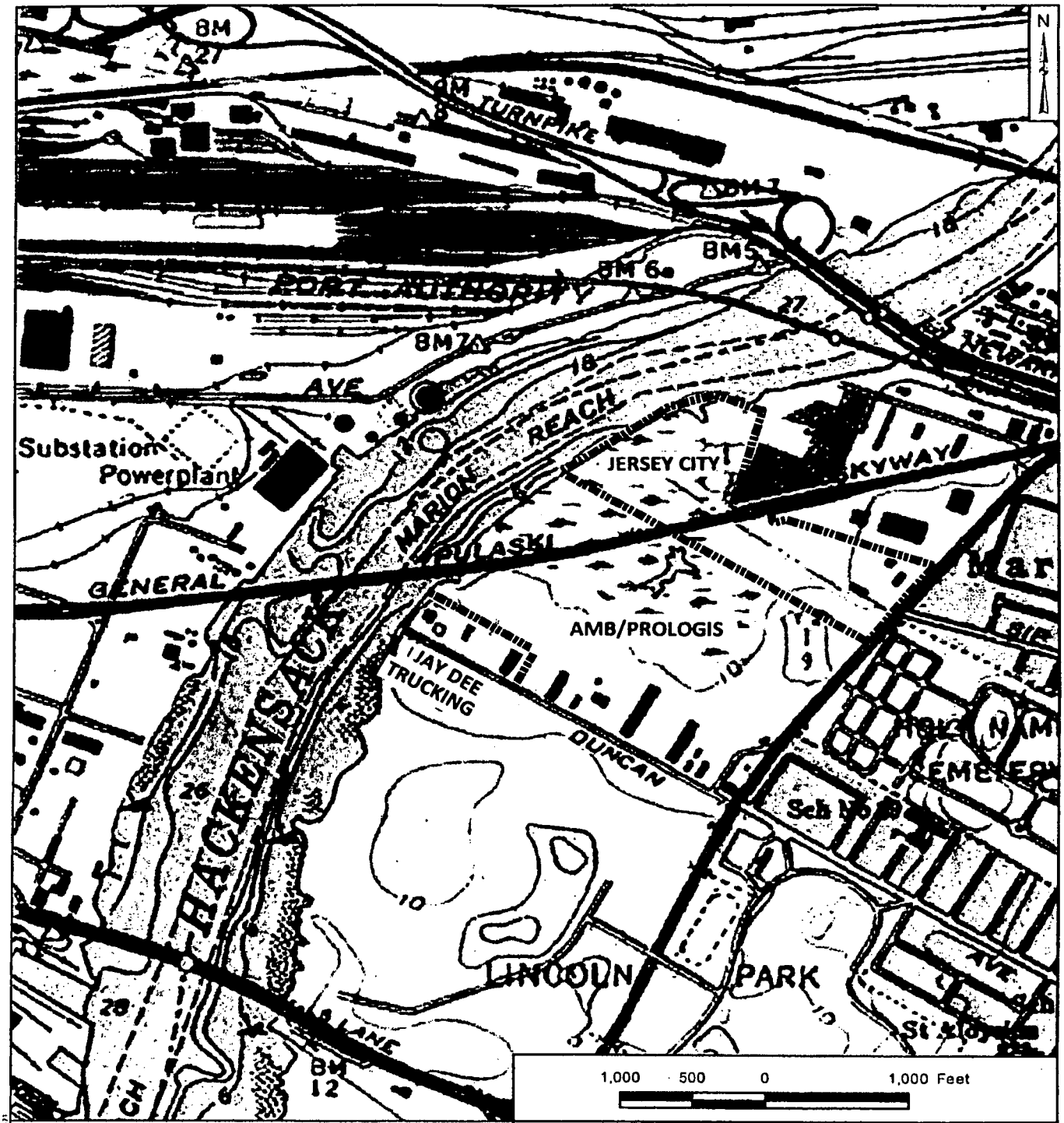


Figure 1

SITE MAP (1995)

PJP LANDFILL, JERSEY CITY, NEW JERSEY



Legend

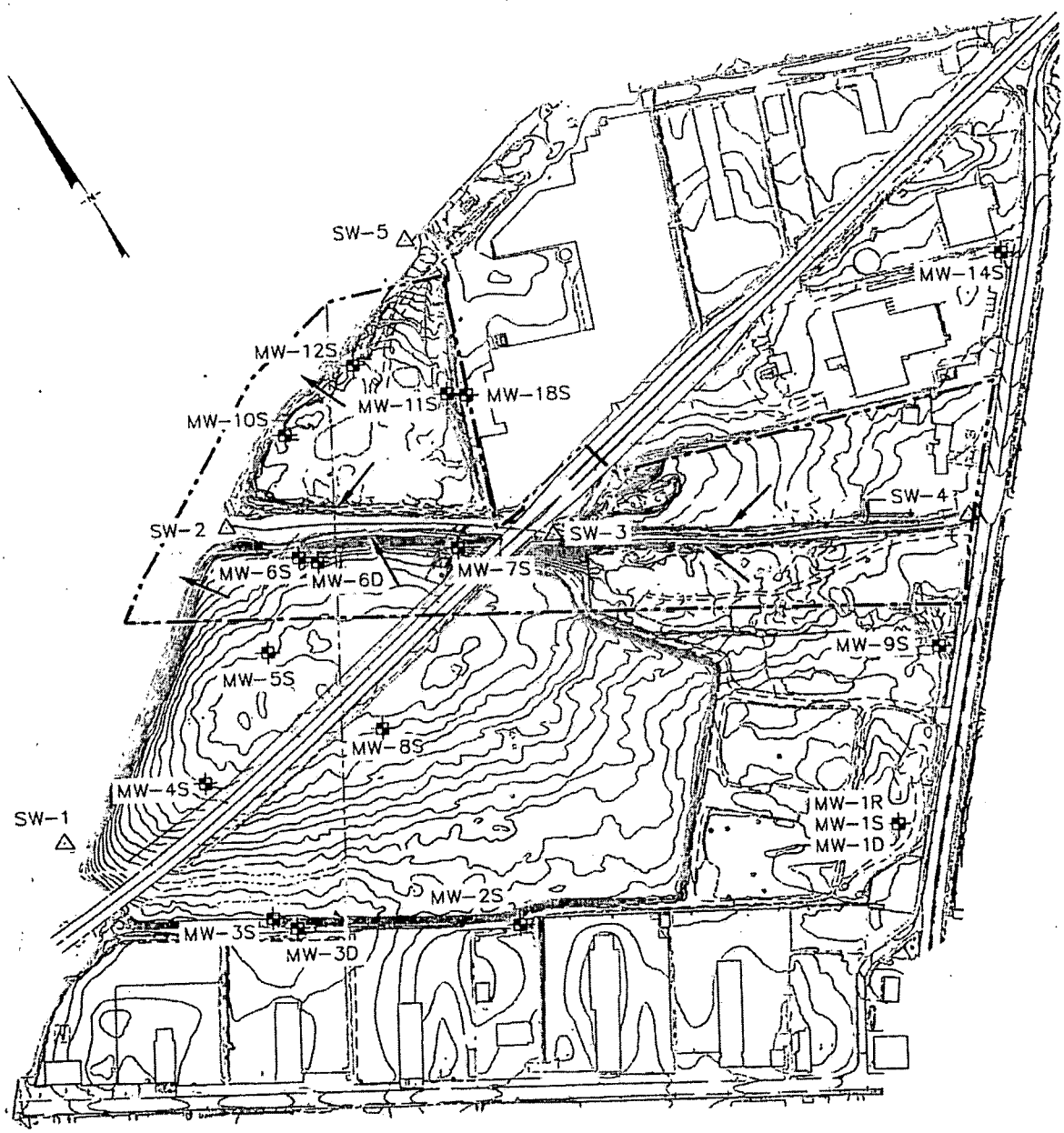
Approximate Property Boundaries

USGS Quadrangle Map
PJP Landfill
Jersey City, New Jersey

Notes
USGS Quadrangle Jersey City, published 1982. Copyright:© 2011 National Geographic Society, i-cubed.

Geosyntec consultants
Columbia, Maryland | April 2012

Figure 2



LEGEND

- CEA BOUNDARY FOR JERSEY CITY
- MW-11S — MONITORING WELL LOCATION
- SW-5 — SURFACE WATER SAMPLE LOCATION
- GROUNDWATER FLOW DIRECTION

500 250 0 500

SCALE: 1" = 500'

NOTE: HORIZONTAL DATUM IS NEW JERSEY STATE PLAN, NAD 1983.

SITE MAP

Geosyntec consultants

COLUMBIA, MARYLAND

DATE:	APRIL 2012
PROJECT NO.	MR0571B
DOCUMENT NO.	
FILE NO.	0571f304

Figure 3